Conference on Effectively Restoring Ecosystems
22-24 August 2000, St. Louis, Missouri

BACKGROUND

Session: Breakout 1B
Topic: Environmental Benefits
Moderator: Lynn Martin, CEIWR-PD
Recorder: Leigh Skaggs, CEIWR-MD
Panelists:

- Gene Stakhiv, CEIWR-PD
- Richard Cole, CEIWR-PD
- Leo Foley, CEMVR
- Pat Cagney, CENWS

Objective: To initiate inquiry on approaches to environmental benefits evaluation, including different field experiences, perspectives, and issues regarding the evaluation of outputs and benefits, and to present findings of an ongoing policy study.
Description: Attendees were made aware of the range of evaluation methods currently being used as well as some of the concepts being explored for potential future applications.

HIGHLIGHTS

The moderator, Lynn Martin, first summarized several issues related to evaluating environmental benefits. Defining and measuring the benefits of an ecosystem restoration project are in effect a characterization of the changes that the ecosystem project is designed to bring about, as well as consideration of the value placed by society on those changes. Selection of the appropriate type or measurement of benefits should be based on how well the measure reflects achievement of study or project objectives, rather than selection of a measurement technique just because the technique or the data to use the technique are readily available. Obviously, different benefit estimation tools that require differing levels of rigor or expertise will be employed for different ecosystem restoration studies depending on study requirements. While many of the same measurement tools employed for impact assessment may be applied to evaluating benefits for restoration projects, additional tools may also need to be developed and used.

The first speaker, Gene Stakhiv (CEIWR-PD), described an ongoing policy study being conducted by IWR for HQ's Planning and Policy Division on "Environmental Benefits Evaluation". Dr. Stakhiv explained the need to make Environmental Quality (EQ) outputs comparable to National Economic Development (NED) outputs (although not necessarily monetized) in order to conduct rigorous evaluations of alternatives. He also touched upon other similarities between EQ and NED analyses, including the need to select appropriate evaluation and decision-making frameworks, the analogous nature of services provided (or that could be provided) under the EQ account (e.g., biodiversity, resilience, endangered species) to the traditional economic services (e.g., recreation, damages prevented, hydropower) provided under the NED account, and to the need to make trade-offs between EQ, NER, and NED outputs. In response to a question from the

audience, Stakhiv explained that the benefit methodologies being developed (and that may be recommended) under the policy study will be coordinated with other agencies, both to increase the likelihood of their acceptance and to benefit from the technical expertise of others.

Richard Cole (CEIWR-PD) next presented "Ecosystem Restoration Decision Support Models: History, Needs, and Possibilities." Dr. Cole reported on the very large number of ecosystem "output" models that have been developed over the last 50 years, and highlighted the differences between the absolute estimation approach, models that use relative value indices, and landscape context simulation models. Cole described several habitat-based output estimation models, which are population-oriented, not ecosystem-oriented, including HEP/HSI and IFIM models. Other models, such as IBI, WET, WVA, WCHE, and RCHARC are community structure-based models, while HGM is a series of function-based models for wetlands ecosystems. Model development trends include changes in orientation from conceptual to computational, from univariate to multivariate, from single to multiple compartments, from static to temporal dynamics, from deterministic to stochastic numerical estimates, and increasing spatial explicitness and comprehensiveness. Some of the landscape context simulation models developed by the Corps include IWREDSS (wetlands resources evaluation) and SDS (successional dynamics simulation model). The possible future development of a "super" relative index model, or a "super" simulation model, incorporating attributes of the structure-based, function-based, habitat-based, and landscape-based models, was hypothesized. In response to a question from the audience regarding the costs of using various output models, Cole stated that absolute estimation models are more expensive to develop and use than relative index models, but potentially provide more comprehensive evaluation tools.

Leo Foley (CEMVR) next presented on the "Upper Mississippi River Environmental Management Program (EMP) Project Prioritization and Habitat Needs." Mr. Cagney explained that the EMP is comprised of both long-term resource monitoring and habitat rehabilitation and enhancement projects (HREP). A habitat needs assessment (HNA), authorized by WRDA 99, is currently underway to identify, at system, pool, and reach levels, long term habitat requirements. The goal of the assessment is not so much to provide all the planning and data needs of every EMP project, but rather to prioritize and aid in the selection process for future habitat projects. The HNA Query Tool, developed in partnership with the USGS, was demonstrated, which can help to identify existing habitat types, quantities, and qualities, to estimate forecast conditions, to develop desired conditions, and to identify habitat needs. In response to several questions from the audience regarding the HNA, Mr. Foley answered that the HNA was put together in two years at a cost of $1 million; that it is primarily a tool to bring more science (and less politics) into decision-making regarding project prioritization; that it is based more on water quality parameters and habitat assemblages than it is on biodiversity and endangered species; and that the long term goal is to provide a GIS for the entire Upper Mississippi River system that provides "bigger picture" information for system prioritization, rather than just project prioritization.

Pat Cagney (CENWS) reported on a "Landscape Ecology Approach for Environmental Outputs." Mr. Cagney explained how the Turning Basin #3 1135 ecosystem restoration project on the Duwamish estuary in the urban area of Seattle was

planned and evaluated using a "landscape ecology" approach. The purpose of the project was to restore rare estuarine habitat for juvenile salmonids and to improve existing stream and fish passage. Project habitat objectives included restoring intertidal marsh, streambed, and riparian buffers and maximizing the land water interface. Landscape objectives included maximizing patch size, increasing biodiversity, and providing for diverse habitats and ecotones. Several other environmental output evaluation methods were considered, but rejected, for the Turning Basin #3 study, including WET (applicable only to wetlands); HGM (does not evaluate a complexity of different habitat types); HEP (community-based models are rare); and Plafkin (field sampling too extensive). The landscape evaluation process involves defining project objectives; identifying landscape parameters that represent objectives and change with alternatives; formulating alternatives for the project; creating GIS maps for different alternatives; running the Fragstats spatial pattern analysis software (used to quantify landscape structure) for each alternative; and comparing the output results with the costs of alternatives through cost effectiveness/ incremental cost analyses. Some of the variables for quantifying landscape structure include vegetative structure (measured by patch size and patch size coefficient of variation); habitat complexity (measured through interspersion/ juxtaposition index); edge (measured by total edge); species diversity (measured by Shannon's diversity and evenness indices); and primary productivity (measured in grams of carbon per square meter per year). Mr. Cagney concluded that the Fragstats approach to measuring environmental output can and does work (for estuaries and larger landscapes), and that in his experience incremental cost analysis, while preferable to cost-benefit analysis for ecological resources, has limitations when ecological outputs cannot be reduced to one metric.